CHAPTER 3

SECTIONS 3.31 – 3.37

PROPULSION, POWER AND LINE SHAFT EQUIPMENT

3.31 Boilers, Steam, and Related Equipment

3.31.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.31.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing; and for pink or white humidity indicators (if applicable). Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

b. Unpacked Equipment or Equipment Packed in Open Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging. See paragraph 3.31.3a. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.31.2 Periodic Inspection

a. Periodicity. Inspect all boiler equipment annually.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.31.3. Make a note of any damage and its location.

Check humidity indicators. Continue this inspection procedure for equipment packaged to method 50 only if the indicators are found to be pink or white. Continue the procedure for all other equipments.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for obvious signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, etc.). Make a note of any damage and its location.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect required repairs to return to RFI condition.

If the preservation is damaged, represerve using the detailed instructions specified herein.

Repair the packaging and packing as required to return to the requirements of subparagraph 3.31.3.

Replace desiccant and humidity indicators as required.

3.31.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Preservation-packaging for steam boilers and related equipment will be in accordance with PPP-B-2920, F-B-2835, MIL-E-16298, MIL-B-16907, F-B-2902, MIL-B-17452, F-B-2903, and MIL-B-18381, Level A protection. Preservation action will be taken in accordance with MIL-STD-2073-1. Shipboard boilers consist of several major end-items of equipment. The below listed items are required to be individually preserved-packaged in accordance with the above boiler specifications:

(1) Oil Burners
(2) Furnace (casings)
(3) Drums and Headers
(4) Generating Tubes
(5) Superheaters
(6) Economizers
(7) Desuperheaters
(8) Air Preheater
(9) Safety Valves
(10) Soot Blowers
(11) Connections and Controls
(12) Instruments
(13) Firebrick

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If the shipper is unable to comply with these requirements, that activity shall turn in the item through the base supply department, which will then bear the responsibility for its proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported in accordance with the requirements of subparagraph 3.31.1.

c. Packing. Packing for steam boilers and related equipment shall be in accordance with PPP-B-2920, F-B-2835, MIL-E-16298, MIL-B-16907, F-B-2902, F-B-2903, MIL-E-17555, or MIL-B-18381, Level A, as applicable. Repair and use the existing containers, or provide new containers.

d. Marking.

(1) Normal. Identification and nomenclature should be on a stamped metal tag permanently affixed to the boiler in accordance with MIL-STD-130. The exterior will be marked in accordance with MIL-STD-129, PPP-B-2920, F-B-2835, MIL-E-16298, MIL-B-16907, F-B-2902, F-B-2903, MIL-E-17555, or MIL-B-18381, as applicable. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. Special markings to be used on containers of boilers and related equipment (as applicable) are:

(a) Desiccant Materials. Method 50 packaged equipment should have the following markings adjacent to specified method markings: "CAUTION - REMOVE PACKAGING, TAPE, DESICCANT, AND HUMIDITY INDICATOR FROM EQUIPMENT PRIOR TO OPERATION".

(b) Method 50 Marking. Marking will be in accordance with MIL-STD-129. When equipment is packaged Method 50, the following precaution will be affixed to the container: "METHOD 50 PACKAGE - DO NOT OPEN UNTIL READY FOR USE".

(c) Unpacking Instructions. Stencil adjacent to the identification markings: "CAUTION - THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE FOLLOWED CAREFULLY. UNPACKING INSTRUCTIONS ARE LOCATED (include location)".

(d) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(e) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(f) Container Orientation. The words "THIS END UP", together with an arrow indicating the top of the container, should be stenciled on all sides of the container.

(g) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These instructions will be secured to the outside of the container in a protected location.

(h) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

3.31.4 Handling

a. Special Handling Equipment and Tools. Boilers are large and heavy. Special lifting equipment; i.e. cranes and straps, will be needed for moving this equipment. Carefully inspect and test lifting equipment prior to use.

b. Special Handling Procedures. Always lift boilers at special lift point padeyes provided for this purpose.

c. Safety Requirements. Observe safety precautions for handling heavy mechanical equipment.

3.31.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
a	b	c & d	e	

a - Store boiler related equipment that should be packaged Method 50, but is not, in a controlled humidity area (including non-RFI equipment). **DO NOT** store outside.

b - Store boiler related equipment that should be packaged Method 20, but is not, in a heated warehouse. **DO NOT** store outside.

c - Store boiler related equipment that is correctly packaged Method 20 or 50 in an unheated warehouse. **DO NOT** remove desiccant from Method 50 packaged equipment. Leave inspection ports accessible for periodic checks of humidity indicators.

d - Store equipment requiring, but not having, Method 10 protection in an unheated warehouse.
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e - Equipment correctly packaged Method 10 can be stored in an open covered storage area.

NOTE

If equipment cannot be stored as required, store in an area that affords the next best level of protection and inform the Inventory Manager.

b. Segregation. No special requirements.

c. Shelf Life. Some boiler equipments have specified shelf lives. Inform the appropriate Inventory Manager if the equipment has exceeded its shelf life. The shelf life is indefinite for items packaged and packed Method 50, and stored as specified. See shelf life directives.

d. Special Storage Requirements. No special requirements.

3.31.6 Transportation

a. General. Weight, size, and configuration may dictate special modes of transportation. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

b. Special. Unique or unusual requirements should be referred to the appropriate Transportation Officer. State and/or local authorities may require special permits. Special right-of-way clearance may also be required.

c. Loading. Always utilize special lifting padeyes to handle or move boilers.

d. Carriers.

(1) Over the Road. Block and brace as necessary to preclude movement. Heavy duty shipboard boilers dictate special heavy lift low boy trailers.

(2) Rail. Block and brace as necessary to preclude movement. Heavy duty shipboard boilers will require flatcars.

(3) Water. Use covered barge or other break bulk carriers for heavy duty boilers.

(4) Air. Not normally shipped by air. If necessary, use care to even weight distribution to protect the aircraft floor.

3.32 Engines, Diesel

3.32.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.32.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing; and for pink or white humidity indicators (if applicable). Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

b. Unpacked Equipment or Equipment Packed in Omen Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging. See subparagraph 3.32.3a. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.32.2 Periodic Inspection

a. Periodicity. Inspect all diesel engines every six (6) months.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.32.3. Make a note of any damage and its location.

Check humidity indicators. Continue this inspection procedure for equipment packaged to method 50 only if the indicators are found to be pink or white. Continue the procedure for all other equipments.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for obvious signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, etc.). Closely inspect all exposed machine and working surfaces. Make a note of the damage, if any, and its location.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return to RFI condition.

If the preservation is damaged, represerve using the detailed instructions specified herein.

Repair the packaging and packing as required to return to the requirements of subparagraph 3.32.3.

Replace desiccant and humidity indicators as required.

3.32.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Equipment will be preservation-packaged to Level A specifications. Preserve in accordance with MIL-STD-2073-1, Methods 20, 40, or 55, as applicable. Reusable containers shall be utilized when possible.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported per subparagraph 3.32.1.

c. Packing. Packing will be to Level A standards with engines blocked, braced, and anchored.

d. Marking.

(1) Normal. Identification will be stenciled on the exterior pack in accordance with MIL-STD-129. Nameplate data should be on a stamped metal plate permanently affixed to equipment in accordance with MIL-STD-130. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. Special markings on equipment containers (as applicable) are:

(a) Desiccant Materials. The following marking should be affixed adjacent to specified method markings: "CAUTION - REMOVE PACKAGING, TAPE, DESICCANT, AND HUMIDITY INDICATOR FROM EQUIPMENT PRIOR TO OPERATION".

(b) Method 50 Marking. Marking will be in accordance with MIL-STD-129. When equipment is packaged Method 50, the following precaution will be affixed to the container: "METHOD 50 PACKAGE - DO NOT OPEN UNTIL READY FOR USE".

(c) Storage Instruction. Stencil on the container the words: "STORE RIGHT SIDE UP - WARNING - SEE UNPACKING INSTRUCTIONS".

(d) Unpacking Instructions. These words should be stenciled adjacent to the identification markings: "CAUTION - THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE FOLLOWED CAREFULLY. UNPACKING INSTRUCTIONS ARE LOCATED (include location)".

(e) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These will be secured to the outside of the container in a protected location.

(f) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(g) Structural or Handling. Mark on the exterior of the shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(h) Container Orientation. The words "THIS END UP", together with an arrow indicating the container top, should be stenciled on all sides of the container.

(i) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

3.32.4 Handling

a. Special Handling Equipment and Tools. No unusual requirements. Check weight and size and use proper equipment to handle engines.

b. Special Handling Procedures. Use slings and spreader bars if engines are on pallet or skid. Lift engines at special designated lift points. **DO NOT** lift with wire strap applied directly to engine or engine mount, as the engine could be seriously damaged.

c. Safety Requirements. No special safety requirements.

3.32.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
a		b		

a - Store equipment which should be packaged Method 50, but is not, in a controlled humidity area. This includes non-RFI equipment. **DO NOT** store equipment outside.

b - Store equipment that is correctly packaged Method 50 in an unheated warehouse.

NOTE

If equipment cannot be stored as required, store in an area that affords the next best level of protection and inform the Inventory Manager.

b. Segregation. No unusual requirements.

c. Shelf Life. Some gaskets have a service or shelf life. Inform the appropriate Inventory Manager if the equipment has exceeded its shelf life. Generally, diesel engines are considered non-deteriorative, but may contain materials or components that can degrade during extended storage. Maintain periodic inspections per subparagraph 3.32.2. Consult cognizant MATREP, Inventory Manager or technical manual for detailed requirements.

d. Special Storage Requirements. Do not superimpose loads.

3.32.6 Transportation

a. General. Any mode of transportation can be used to transport engines; however, the weight and size of some engines may seriously limit the type vehicle that can transport them. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

b. Special. Any unique or unusual requirements should be referred to the appropriate Transportation Officer for resolution.

c. Loading. Lift heavy engines by padeyes on shackles at designated lift points. Block and brace to prevent shifting or movement. Protect equipment from elements at all times.

d. Carriers. Transportation may be by truck, rail, water or air.

3.33 Engines, Gas Turbine

3.33.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.33.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing; and for pink or white humidity indicators (if applicable). Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required. Check pressure on power turbine and gas generator containers by opening check valve.

b. Unpacked Equipment or Equipment Packed in Open Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging. See subparagraph 3.33.3a. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.33.2 Periodic Inspection

a. Periodicity. Inspect all gas turbines annually.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.33.3. Make a note of any damage and its location.

Check pressure on power turbine and gas generator containers by opening the check valve.

Check humidity indicators. Continue this inspection procedure for equipment packaged to method 50, only if the indicators are found to be pink or white or the container has been depressurized. Continue the procedure for all other equipment.

Carefully remove any packing and packaging necessary to provide access to the gas turbine engine. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for obvious signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, etc.). Closely inspect all exposed machine and working surfaces. Make a note of damage, if any, and its location.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return the equipment to RFI condition.

If the preservation is damaged, represerve using the instructions specified herein.

Repair the packaging and packing as required to return to the requirements of subparagraph 3.33.3.

Replace desiccant and humidity indicators as required.

3.33.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Gas turbine engine equipment will be preserved-packaged to Level A standards. It will be preserved in accordance with the requirements of MIL-STD-2073-1, Method 50.

NOTE: LM 2500 gas turbines will be preservation-packaged in accordance with MIL-E-17341, Level A and preserved in accordance with MIL-STD-2073-1, Method 55.

Gas turbines will be packaged in special pressurized metal containers. They shall be preserved with MIL-PRF-7808L lube oil with 1.2 percent Bryco 599 additive. Support equipment (hardware and installation components) requires Level C protection in accordance with MIL-STD-2073-1, Method 10.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported in accordance with the requirements of subparagraph 3.33.1.

c. Packing. Packing shall be to Level A standards (not for long term storage).

NOTE: Packing of the LM 2500 gas generator (Type II) and the power turbine (Type I) shall be to level B. This equipment is normally packed in two specialized metal containers conforming to General Electric drawing numbers 106C7149 and 106C7150, respectively.

Gas turbine engine support equipment will normally be packed in two standard 8'x8'x20' metal cargo containers whose interior structures have been modified to house parts and equipment (Kit 537L102G02).

d. Marking.

(1) Normal. Nomenclature and equipment identification will be stenciled on exterior of containers in accordance with MIL-STD-129, or MIL-E-17341, and Support Equipment ANSI Turbine Containers MH5.4. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. Special markings used on containers of packaged gas turbine engines (as applicable) are:

(a) Desiccant Materials. The following marking should be affixed adjacent to specified method markings: "CAUTION - REMOVE PACKAGING, TAPE, DESICCANT, AND HUMIDITY INDICATOR FROM EQUIPMENT PRIOR TO OPERATION".

(b) Method 50 Marking. Marking will be in accordance with MIL-STD-129. When equipment is packaged Method 50, the following precaution will be affixed to the container: "METHOD 50 PACKAGE - DO NOT OPEN UNTIL READY FOR USE".

(c) Unpacking Instructions. Stencil adjacent to the identification markings: "CAUTION - THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE FOLLOWED CAREFULLY. UNPACKING INSTRUCTIONS ARE LOCATED (include location)".

(d) Metal Containers. When the gas turbine engine is packed in a metal container, the container should have the following markings: "DO NOT BREAK THE SEALS ON THIS CONTAINER UNTIL READY FOR USE UNLESS INSPECTION OF THE INTERIOR HUMIDITY INDICATOR SHOWS RENEWAL OF DEHYDRATING AGENT OR REPRESERVATION TO BE NECESSARY".

(e) Pressure-Charged Equipment. The container will be marked to indicate the system is pressurized to 4 1 /2 pounds per square inch with dry Air.

(f) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(g) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These will be secured to the outside of the container in a protected location.

(h) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(i) Container Orientation. The words "THIS END UP", together with an arrow indicating the top of the container, should be stenciled on all sides of the container.

3.33.4 Handling

a. Special Handling Equipment and Tools. Special handling tools and dockside dollies required for engine installation and removal will be packed in special containers. This equipment is heavy and can only be lifted by high capacity forklifts and cranes.

b. Special Handling Procedures. Use cranes and special dollies for moving this equipment.

c. Safety requirements. **DO NOT** open pressurized containers without bleeding off pressure.

3.33.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
a	b	c & d		

a - Store equipment which should be packaged Method 50, but is not, in a controlled humidity area. This includes non-RFI equipment.

b - Support equipment that requires, but does not have Method 10 protection, can be stored in an unheated warehouse.

c - Gas generators and turbines correctly packaged Method 50 can be stored in open covered storage. **DO NOT** remove desiccant from Method 50 packaged equipment. Leave humidity indicators accessible for periodic checks.

d - Equipment properly packaged Method 10 may be stored in an open covered storage area.

NOTE

If equipment cannot be stored as required, store in an area that affords the next best level of protection and inform the Inventory Manager.

b. Segregation. None required.

c. Shelf Life. Some resilient mounts have service/shelf lives. Check technical manuals for specific shelf life directives.

d. Special Storage Requirements. No special requirements.

3.33.6 Transportation

a. General. The size and weight of the equipment may severely limit the type vehicles that can carry it. State or local authorities may require special permits and right-of- way clearances. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

Note: LM 2500 engines are frequently shipped by air due to critical supply and quick turn around repair cycles. LM2500 may be shipped by any mode providing priority shipment is used.

b. Special. Any unusual or unique requirements should be referred to the appropriate Transportation Officer for assistance. ,

c. Loading. Always utilize special lifting pads to handle or move engines. Block and brace to avoid movement of special containers.

d. Carriers.

(1) Over the Road. Will require open flat bed trailers due to size and weight.

(2) Rail. Will require flatcars due to size and weight.

(3) Water. Will require covered barge or break bulk carrier. Store unpackaged equipment below weather decks if possible.

(4) Air. Use skid to ensure proper weight distribution and avoid damage to floor of aircraft from unpackaged equipment.

3.34 Gears and Gear Assemblies

3.34.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect equipment to make sure it meets Level A preservation-packaging standards. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.34.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing. Report all damage, insufficient preservation-packaging and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

NOTE: **DO NOT** open containers for complete gear sets that are shipped assembled.

b. Unpacked Equipment or Equipment Packed in Open Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging See subparagraph 3.34.3a. Inspect all unpacked gears and gear assemblies to make sure that the identification plates, oil holes, sight flow fittings, or electrical wiring have not been painted over. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation-packaging and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.34.2 Periodic Inspection

a. Periodicity. Inspect gear sets every six (6) months.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. Make a note of any damage and its location..

NOTE: **DO NOT** open containers for complete gear sets that are shipped assembled.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for obvious signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, etc.). Closely

inspect all exposed machine and working surfaces. Make a note of the location and damage, if any.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return to RFI condition.

If the preservation is damaged, represerve using the detailed instructions specified herein.

Repair the packaging and packing as required to return to the requirements of subparagraph 3.34.3.

3.34.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Gear sets will be preservation-packaged Level A in accordance with MIL-T-17286 and preserved in accordance with MIL-STD-2073-1.

(1) Exercise caution not to open the gear assembly enclosure since all bearings, gears, rollers, and other mechanical components are factory lubricated, preserved, and sealed.

(2) All flange openings shall be sealed.

(3) External surfaces shall be painted or, if machine-finished, coated with MIL-PRF-16173, grade 1 preservative. Internal surfaces shall be coated with MIL-PRF-16173, grade 2 preservative.

(4) When shipped disassembled, gear teeth, high speed pinions and the intermediate rotating assembly, after preservative application, shall be wrapped with a single layer of aluminum foil (QQ-A-1876) or greaseproof, waterproof, noncorrosive barrier material (MIL-B-121,Type I, Grade A, Class 1). If required the wrapped item may be overwrapped with any suitable material (MIL-B-121 or MIL-B-131).

(5) Journal wrappings should be coated with an adhesive compound and overwrapped with cotton or burlap cloth.

(6) Individual gears should be wrapped, anchored to pallet or skid, and covered with a reinforced shroud or tarpaulin.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported per subparagraph 3.34.1.

c. Packing. Packing shall be to Level A in accordance with MIL-T-17286. Repair and use the existing container, or provide a new container in accordance with MIL-T-17286 or requirements of the equipment technical manual or manufacturer's drawings.

d. Marking.

(1) Normal. Equipment nomenclature and identification will be affixed to the outer wrap in accordance with MIL-STD-129 and MIL-T-17286. Gear assemblies should have identification plates permanently affixed to the case in accordance with MIL-STD-130. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. Special markings used on packaged gear assemblies (as applicable) are:

(a) Unpacking Instructions. Stencil adjacent to the identification markings: "CAUTION - THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE FOLLOWED CAREFULLY. UNPACKING INSTRUCTIONS ARE LOCATED (include location)".

(b) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(c) Container Orientation. The words "THIS END UP", together with an arrow indicating the top of the container, will be stenciled on all sides of the container.

(d) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

(e) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These will be secured to the outside of the container in a protected location.

(f) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(g) Volatile Corrosion Inhibitors. When items are unit protected with Volatile Corrosion Inhibitors (VCI) material, the packages shall be marked: "WASH HANDS AFTER HANDLING VCI MATERIALS TO AVOID IRRITATION OF EYES AND SKIN".

(h) Matched Sets. All matched gear sets shall be marked as a set on each container. See MIL-STD-129 for detailed instructions.

3.34.4 Handling

a. Special Handling Equipment and Tools. Most propulsion gear assemblies are extremely large and heavy and can only be handled with special high-capacity cranes. Lifting capacities should therefore be carefully checked before attempting to move these assemblies.

b. Special Handling Procedures. Propulsion gear assemblies are very critical and expensive. Most are extremely large and heavy, and the weight is often unbalanced. They must be handled by special fittings on the assembly base. Move assemblies as little as possible.

c. Safety Requirements. Use extreme caution when moving or shifting the gear assemblies.

3.34.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
a				

a - Propulsion gear assemblies are extremely critical in terms of availability and expensive. Always give them the best available protection, even if non-RFI. Store inside if size permits. Contact the Inventory Control Point for specific requirements (such as portable dehumidifiers) for each particular case. Store other gear assemblies, like those for deck machinery, in the highest level of inside storage available, regardless of packaging.

NOTE: If inside storage is not immediately available, gear sets may be stored in open covered storage for a maximum of six (6) months, if Level A packaging is intact. When finally moved inside, inspect gear sets immediately per subparagraph 3.34.1.

b. Segregation. No unusual requirements.

c. Shelf Life. Indefinite when packaged, packed, and stored as specified.

d. Special Storage Requirements. Caution should be used to insure weight distribution on warehouse floors.

3.34.6 Transportation

a. General. Gear assemblies may be shipped by any mode, but the size and weight of some propulsion gear assemblies may severely limit the type vehicle that can carry them. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

b. Special. State and local authorities may require special permits and right-of-way clearances. Any unique or unusual requirements should be referred to the appropriate Transportation Officer for resolution.

c. Loading. Gear assemblies may require special high lift equipment for loading and/or unloading. Extreme care should be taken to not drop the assemblies, as jarring could damage or jam gear teeth.

d. Carriers.

(1) Over the Road. May require special heavy weight low-boy trailers.

(2) Rail. May require open flatcars. Care should be taken to insure weight distribution.

(3) Water. May require break bulk carrier. **DO NOT** ship on weather deck.

(4) Air. Extreme caution should be used to avoid damage to the floor of the aircraft. Weight of equipment requires multiple tie downs.

3.35 Propellers

3.35.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.35.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing. Report all damage, insufficient preservation-packaging and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

b. Unpacked Equipment or Equipment Packed in Open Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Check propeller coatings for bare spots, gouges, and peeling. Check blade edge protectors for dents, gouges, loose or broken straps, or other damage, such as chain and sling marks, possibly indicating concealed damage. Check whether or not the propeller or technical manuals are classified. Report all damage, insufficient preservation-packaging and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.35.2 Periodic Inspection

a. Periodicity. Inspect propellers stored in open covered storage every six (6) months. Propellers stored in a warehouse should be inspected every three (3) years by a certified propeller inspector.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.35.3. Make a note of any damage and its location.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for obvious signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, bare spots, peeling, etc.). Check blade edge protectors for dents, gouges, loose or broken straps, or other damage, such as chain and sling marks, possibly indicating concealed damage. Closely inspect all exposed machine and working surfaces. Make a note of the location and damage, if any.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return to RFI condition.

If the preservation is damaged, represerve using the detailed instructions specified herein.

Repair the packaging and packing as required to return to the requirements of subparagraph 3.35.3.

3.35.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Propellers require Level A protection in accordance with MIL-DTL-2845.

(1) Propellers shall be preserved with a two (2) layer strippable compound (MIL-PRF-6799, Type II, Multi-Coat System). The top layer is white, the bottom layer black.

(2) All exposed finished-machine surfaces (threads, sleeves, etc.) not covered by the strippable compound should be coated with an appropriate preservative. Overwrap these areas with a flexible, greaseproof, waterproof material conforming to MIL-B-121, Type I, Grade A, Class 2.

(3) Surfaces in direct contact with wood cradles will be wrapped with at least three (3) layers of material conforming to MIL-B-121, Type I, Grade A, Class 2.

(4) Seal each end of propeller hub. Use steel plugs to seal finished-machine hubs and wood plugs to seal unfinished hubs.

(5) Apply blade edge protectors over the protective coating (ship propellers only). These blade edge protectors are covered with a minimum of two (2) layers of canvas and are held in place with steel straps.

(6) Propellers incorporating an air-emitter system will have the openings covered with a minimum ¾ inch-wide pressure sensitive tape (ASTM D5486). Seal other openings with either tape or waterproof barrier material (PPP-B-1055, Class E-2 or L-2). When the opening is vulnerable to damage, protect the covering with weather-resistant hardboard, wood, plywood, or metal covers.

(7) The hub of controllable pitch propellers should be filled with the standard operating hydraulic oil and an expansion tank attached to insure that the hub is completely full at all times.

(8) Propeller accessories should be packaged Level A using wood or metal containers.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported per subparagraph 3.35.1.

c. Packing. Packing shall be Level A in accordance with MIL-DTL-2845. Propellers over twelve (12) feet in diameter must be shipped in a special hydraulically operated tiltable cradle. Make sure lifting eyebolts are intact and properly marked.

(1) When possible, propellers should be crated with skids, covers, and with two (2) inches of clearance on all sides. Shipping containers should be in accordance with MIL-C-104, MIL-C-3774, or MIL-C-9897.

(2) Propeller accessories should be attached, by banding or strapping, to the propeller.

(3) Propeller blade sets for controllable pitch propellers should be packed in hub sets.

(4) Small unpackaged propellers, when turned in, must be cushioned in open containers for handling and storage. Propellers over 40 pounds must be provided with lifting eyebolts for handling. Classified equipment may require further covering or packaging depending on local storage conditions.

d. Marking.

(1) Normal. Marking will be in accordance with MIL-STD-129 and MIL-DTL-2845. An identification plate should be permanently affixed to each propeller in accordance with MIL-STD-130. Enclose the propeller certification form in a transparent, waterproof, greaseproof bag, prominently marked "CERTIFICATION FORM" and heat seal the bag. Attach the bag to the propeller hub or blade so that it is visible, readily available, and will remain with the propeller until propeller use. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. The following special markings on propeller containers (as applicable) are:

(a) Container Orientation. The words "THIS END UP", together with an arrow indicating the top of the container, and "STOW FLAT ON CONTAINER SKIDS", will be stenciled on all sides of the container.

(b) Eyebolts. Mark or tag on each propeller: "HANDLE BY EYEBOLTS".

(c) Blade Protectors. Each propeller shall be marked with the following information: "DO NOT REMOVE BLADE EDGE PROTECTORS UNTIL PROPELLER INSTALLATION IS COMPLETE".

(d) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(e) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(f) Classified Shipments. Do not affix packing lists to the outside of the container for classified material. Forward in accordance with Department of Defense regulations.

(g) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

(h) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These will be secured to the outside of the container in a protected location.

(i) Blade Sets. For controllable pitch blade sets, each blade shall be marked with the propeller serial number on both the pressure face and the suction face. When multiple containers are required for a single hub set, the exterior of each container shall be marked with the propeller serial number.

NOTE: If the propeller is a NAVSEA controlled item, the following statement should be stenciled on the container: "If container is damaged, notify the NAVSEA 2S End Item Manager (Code 05824), NAVICP 5450 Carlisle Pike, P.O. Box 2020, Mechanicsburg, PA 7055-0788".

3.35.4 Handling

a. Special Handling, Equipment and Tools. Some propellers are extremely large and heavy and can only be handled by cranes with heavy lift capabilities. Check weight capabilities before attempting to move the propeller.

b. Special Handling Procedures. Handle with extreme care. Propellers are constructed of inherently critical material, machined to close tolerances, are easily damaged, and extensive expenditures of funds are required to repair even slight damage. Keep the container upright. The extreme heavy weight, large dimension, and

critical nature of propellers require that the utmost attention to detail be exercised in equipment handling procedures. **Handle large propellers by installed eye bolts only**.

c. Safety Requirements. Use caution when handling propellers.

3.35.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
		a	b	

a - If space is available, store propellers in an unheated warehouse. This includes non-RFI equipment.

b - When space is not available store propellers in open covered storage. Store propellers inside enclosures of adequate size and strength to preclude damage from material handling equipment. Place each propeller on wood skids of sufficient size to support the propeller above the ground level. The enclosure must be constructed on a concrete slab with a weight bearing capacity greater than the weight of the propeller. The enclosure may be constructed of wood or metal and may be of the nailed or demountable type. Enclosure sides and top are to provide weather protection as well as impact protection. Additional weather protection is provided by covering the enclosure with flexible waterproof material.

b. Segregation. Store classified equipment in designated classified equipment storage area.

c. Shelf Life. Indefinite when packaged, packed, and stored as specified.

d. Special Storage Requirements. The pitch of propellers can be altered by extreme changes in temperature. Avoid sudden extreme changes in temperature while the propeller is in storage. **DO NOT** stack containers.

3.35.6 Transportation

a. General. Propellers may be shipped by any mode; however, the weight and size of some propellers will severely limit the type vehicle that can transport them. Special permits may be required by state or local governments for over-the-road shipment. Movement of propellers may require special right-of-way clearances.

b. Special. Any propeller that is classified must be covered during shipping. Any unique or unusual requirements should be referred to the appropriate

Transportation Officer for resolution. Propellers twelve (12) feet or more in diameter require special hydraulically operated tiltable cradles for shipment.

c. Loading. **Lift by special eyebolts only**. Ensure lifting straps and cranes are certified to handle the propeller weight.

d. Carriers.

(1) Over the Road. The height and weight of large ship propellers will require special hydraulically operated tiltable cradles. These cradles will be required for bridge clearances. Ensure that classified propellers are covered during shipping.

(2) Rail. Large ship propellers will require flatcars. Use special air cushioned cars and special hydraulically operated tiltable cradles for propellers over twelve (12) feet in diameter.

(3) Water. Covered barges or other break bulk carrier will be required to move large propellers. Propellers in excess of twelve (12) feet should be shipped in special hydraulically operated tiltable cradles.

(4) Air. Propellers exceeding eighteen (18) feet six (6) inches in diameter may not be shipped by Air. The military airlift command requires special hydraulically operated tiltable cradles to provide weight distribution to prevent damage to the aircraft floor.

3.36 Shafts, Ship Propulsion

3.36.1 Receipt Inspection Requirements

a. Packaged Equipment. Inspect equipment to insure it meets Level A preservation-packaging and packing standards. Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.36.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing. Inspection does not require opening of containers or sheathing. Report all damage, insufficient preservation-packaging, and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required in the appropriate paragraph.

b. Unpacked Equipment or Equipment Packed in 0pen Crates or Boxes. Inspect unpackaged equipment for obvious signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, or other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging. See subparagraph 3.36.3a. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation-packaging and insufficient packing to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.36.2 Periodic Inspection

a. Periodicity. Inspect all propeller shafts annually.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.36.3. Make a note of any damage and its location.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Carefully remove the barrier material from one end of the shaft, an accessible part of the bearing surface, and approximately one-quarter (1/4) of the accessible part of the shaft. Inspect the shaft and preservative layer for obvious signs of damage, deterioration, or distortion (e.g. corrosion, cracks, gouges, bent surfaces, etc.). Closely inspect all exposed finished-machine surfaces (e.g., flange mating surfaces, shaft keyway, threads, etc.). Make a note of any damage and its location.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return to RFI condition.

If the preservation is damaged, represerve using detailed instructions of MIL-DTL-2845.

Repair packaging and packing to comply with the requirements of subparagraph 3.36.3.

3.36.3 Packaging/Preparation for Delivery

a. Preservation-Packing. Provide Level A protection in accordance with MIL-DTL-2845. The preservative used on the shaft is dependent on the material from which the shaft is made, the machine finish, and whether or not the shaft is rubber covered.

(1) The following list is provided to guide personnel in the correct selection of a preservative coating (as applicable). All preservatives are in accordance with MIL-STD-2073-1 and MIL-PRF-16173:

• Bronze, brass, nickel copper shaft surfaces; molded rubber, laminated phenolic or brass backed surfaces; and tube from stern tube and strut bushings.	No preservative required.
• Rubber-covered shaft surfaces.	Dust with talc.
• Finish-machined steel, brass, nickel copper surfaces, or rough machined steel forgings.	Coat with a thin film, hard - drying (MIL-PRF-16173, grade 1) preservative.
• Line shaft and main thrust bearings.	Coat with a thin film, (MIL-PRF-16173, grade2) soft-drying preservative.
• Miscellaneous finished forged and rolled-steel parts, or steel and iron castings.	Coat with thin film, transparent, nontacky (MIL-PRF-16173, grade 4) preservative, or volatile corrosion inhibitor.
• Internal surfaces (oil contacting).	Coat with a thin film, soft-drying (MIL-PRF-16173, grade 2) preservative.
• Internal surfaces (water contacting).	Coat with a water displacing, thin film (MIL-PRF-16173,grade3 or 5) preservative. (see NOTE)
• Roller or ball bearings.	See chapter on bearings.

NOTE: Use MIL-PRF-16173 grade 5 preservative when chemical boil-out cannot be used for removal or when hot water or steam removal is preferred.

(2) The following information is provided to help personnel apply Temporary Preservation (as applicable) to shafts:

(a) Thoroughly clean all areas of missing or damaged preservative (with the exception of finish-machined steel and thrust bearing surfaces) by any method that will accomplish the cleaning process without damaging the shaft. Clean all finish-machined steel and thrust bearing surfaces with a solvent cleaner and a fingerprint removal agent.

(b) Dry all cleaned areas thoroughly before any preservative materials are applied. Dry by draining or with compressed air.

(c) Apply the original form of preservative (see subparagraph 3.36.3a(1) or MIL-DTL-2845) or apply preservative grease (MIL-PRF-10924) to the surface using a clean, lint-free cloth.

(d) External finish-machined steel surfaces protected with preservative and threaded or machined shaft ends will be wrapped with heavy-duty, greaseproof, waterproof barrier material (MIL-B-121, Type I, Grade A, Class 2). Overwrap with at least three layers of eight (8) ounce or heavier canvas or equivalent.

(e) Follow the overwrap with one of the following protective wraps:

1. Wrap area with thin gauge steel (.0179 +/- .005 in., or 26 gauge) secured in place with corrosion-resistant steel strapping or equivalent.

2. Apply one-by-two (1 x 2) inch, nominal, wood strip lagging running the entire length of the protected area. Space the strips no more than one (1) inch apart and secure with corrosion-resistant steel strapping. Fasten the steel strapping to each lagging strip using nails or staples. Take care to prevent the point of the fastener, nail or staple, from penetrating the inside surface of the lagging strips.

(f) Seal each end of the propeller shaft. Use steel plugs to seal finish-machined hubs and wood plugs to seal unfinished hubs.

(g) Surfaces in contact with wood cradles will be wrapped with at least three (3) layers of material conforming to MIL-B-121, Type I, Grade A, Class 2.

NOTE: Preservation-packaging for storage of repair parts on submarines is beyond the scope of this handbook. Refer to MIL-STD-758.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported per subparagraph 3.36.1.

c. Packing. Packing shall be Level A in accordance with MIL-DTL-2845.

(1) Shafting Three (3) Inches or Less in Diameter. Shafts are packed in wooden boxes.

(2) Shafting Larger Than Three (3) Inches in Diameter. Shafts are cradled, mounted and secured on a skid base to prevent shaft deflection, shifting and damage that could result from handling, storage and shipment.

(3) Make sure shaft flanges, end connectors, keyways, threads, and tapered surfaces are protected at all times. Use special shaft containers and cradles. Make sure that support points in cradle are located at quarter points of shaft. If the shaft is over fifteen (15) feet long, cradle support points should be no further apart than four (4) feet.

(4) Boxes and skids will be built to specifications dependent upon the shaft diameter and length.

d. Marking.

(1) Normal. Marking is in accordance with the requirements of MIL-STD-129, MIL-DTL-2845, and as specified herein. See Chapter 2 subparagraph 2.2.6 for container markings.

(2) Special. Special markings used on containers of shafts (as applicable) are:

(a) Multiple-Trip Containers. Multiple-trip containers will be marked "REUSABLE," and instructions will be provided for container disassembly and content removal. These will be secured to the outside of the container in a protected location.

(b) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(c) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE". Mark load-bearing areas and lift points.

(d) Container Orientation. The words "THIS END UP" together with an arrow, indicating the container top, should be stenciled on all sides of the container.

(e) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

NOTE: If the shaft is a NAVSEA controlled item, the following statement should be stenciled on the container: "If container is damaged, notify the NAVSEA 2S End Item Manager (Code 05824), NAVICP 5450 Carlisle Pike, P.O. Box 2020, Mechanicsburg, PA 7055-0788".

3.36.4 Handling

a. Special Handling Equipment and Tools. Some shafts are extremely large and can only be handled by cranes with heavy lift capabilities. Check weight capabilities before attempting to move the shaft.

b. Special Handling Procedures. Handle with extreme care. Avoid all unnecessary movement of shafts. Shafts are easily damaged as they are made of inherently critical material; extensive expenditures of funds are required to repair even slight damage. The extremely heavy weight, large dimensions, and critical nature of the shaft require the utmost attention to detail in equipment handling procedures.

c. Safety Requirements. Use extreme caution due to heavy lift requirements. Use sling points, lifting eyes, spreader bars, and center of balance markings when handling.

3.36.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
			a	

a - Cradles are located at the shaft quarter points. For shafts over 15 feet long, cradles are spaced at a maximum of 4 feet. Equipment may be stored in the open on a concrete slab with enclosures designed to protect it from the weather. Enclosures must be of adequate size and strength to preclude damage from material handling equipment. They may be constructed of wood or metal and may be of the nailed or demountable type. Enclosure sides and top are to provide weather protection as well as impact protection. Added weather protection may be provided by covering the enclosure with flexible waterproof material. Storage Requirements are the same whether shafts are RFI or non-RFI.

b. Segregation. There are no compatibility problems however **DO NOT** store in the vicinity of corrosive materials.

c. Shelf Life. Indefinite when packaged, packed and stored as specified.

NOTE: Rubber covered propulsion shafts have a shelf life. Consult cognizant Inventory Manager if requirements are unknown.

d. Special Storage Requirements. **DO NOT** superimpose loads.

3.36.6 Transportation

a. General. Shafts may be shipped by any mode, but the extremely heavy weight and size of some shafts severely limit the type vehicles that can transport them. In some cases special permits and/or right-of-way clearances may be required by local authorities. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

b. Special. Shafts must be shipped in special cradles to prevent bowing and bending. Any unique or unusual requirements should be referred to the appropriate Transportation Officer for resolution.

c. Loading. Special tie down considerations must be given to securing shafts to cradles and vehicles. Special cushioning is required to protect shaft from chafing and gouging. Shafts require special handling equipment to load and unload.

d. Carriers.

(1) Over the Road. Length and weight of shaft may require extra long trailer to support the shaft.

(2) Rail. Length of shaft may preclude shipment by rail.

(3) Water. Length of shaft may require deck loading. If deck loaded, construct a waterproof barrier around the entire shaft.

(4) Air. Shafts must be on special trailers to provide weight distribution and prevent damage to the aircraft floor.

3.37 Turbines, Steam

3.37.1 Receipt Inspection Requirements

a. Packaged Equipment**.** Inspect packaged equipment containers for presence and legibility of markings (see subparagraph 3.37.3d); for obvious signs of damage, deterioration, and/or distortion; for correct preservation-packaging; for proper blocking and bracing; and for pink or white humidity indicators (if applicable). Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

b. Unpacked Equipment or Equipment Packed in Open Crates or Boxes. Inspect unpackaged equipment for signs of damage, deterioration, distortion, and lack of anchoring hardware, blocks and braces, and any other protective devices necessary to prevent damage to equipment during handling and storage. Inspect equipment for the presence of damage to the preservation-packaging See subparagraph 3.37.3a. Unpackaged equipment must be secured to pallet, box, or crate to avoid damage during handling. Report all damage, insufficient preservation-packaging, insufficient packing, and pink or white humidity indicators to the applicable MATREP or Inventory Manager. Remark, represerve or repack, as required.

3.37.2 Periodic Inspection

a. Periodicity. Steam turbines should be inspected annually.

b. Procedure. Inspect containers for obvious signs of damage, deterioration, or distortion and for proper blocking and bracing. See subparagraph 3.37.3. Make a note of any damage and its location.

Check humidity indicators. Continue this inspection procedure for equipment packaged to method 50 only if the indicators are found to be pink or white. Continue the procedure for all other equipments.

Carefully remove packing and packaging as required to provide access to the equipment. As the packing and packaging must be reused, take care not to damage it.

Inspect equipment and preservation for signs of damage, deterioration, or distortion (e.g., corrosion, cracks, gouges, bent and distorted surfaces, etc.). Closely inspect all exposed machine and working surfaces. Make a note of any damage and its location.

If the equipment is damaged, report the damage to the MATREP or Inventory Manager. If possible, effect repairs required to return to RFI condition..

If preservation is damaged, represerve using the detailed instructions specified herein.

Repair packaging and packing as required to meet subparagraph 3.37.3 requirements.

Replace desiccant and humidity indicators as required.

3.37.3 Packaging/Preparation for Delivery

a. Preservation-Packaging. Provide Level A protection in accordance with MIL-T-17286. Preserve in accordance with MIL-STD-2073-1. Steam turbines that are turned in unpackaged must be anchored to a pallet or skids for handling and storage unless the turbine base has fittings installed. If available, use specially designed turbine bases.

b. Responsibility. The shipper shall be responsible for providing the correct preservation-packaging and packing. If that activity is unable to comply with these requirements, it shall turn in the item through the base supply activity, which will then bear the responsibility for proper preservation and packing. Incorrect or damaged preservation-packaging or packing will be reported per subparagraph 3.37.1.

c. Packing. Packing shall be Level A in accordance with MIL-T-17286.

d. Marking.

(1) Normal. Nomenclature and identification will be affixed to the exterior pack in accordance with MIL-T-17286 and MIL-STD-129. Name plate data should be on a stamped metal plate permanently affixed to the turbine in accordance with MIL-STD-130. See Chapter 2, subparagraph 2.2.6 for container markings.

(2) Special. Special markings used on steam turbine containers (as applicable) are:

(a) Desiccant Materials. For Method 50 packaged equipment the following marking should be affixed adjacent to specified method markings: "CAUTION - REMOVE PACKAGING, TAPE, DESICCANT, AND HUMIDITY INDICATOR FROM EQUIPMENT PRIOR TO OPERATION".

(b) Method 50 Marking. Marking will be in accordance with MIL-STD-129. When equipment is packaged Method 50, the following precaution will be affixed to the container: "METHOD 50 PACKAGE - DO NOT OPEN UNTIL READY FOR USE".

(c) Unpacking Instructions. Stencil adjacent to the identification markings: "CAUTION - THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE FOLLOWED CAREFULLY. UNPACKING INSTRUCTIONS ARE LOCATED (include location)".

(d) Critical Tolerance Equipment. Unit packs, shipping containers, and unpacked shipments should be marked with the following: "CRITICAL, CLOSE TOLERANCE OPERATING EQUIPMENT. HANDLE WITH CARE. DO NOT DROP OR SUBJECT TO SHOCKS OR JARS".

(e) Technical Manuals. The location of technical manuals should be marked on the packing list and the shipping container.

(f) Container Orientation. The words "THIS END UP", together with an arrow indicating the container top, should be stenciled on all sides of the container.

(g) Structural or Handling. Mark on exterior of shipping container: "CENTER OF BALANCE" with vertical lines indicating the center of balance, and "SLING HERE." Mark load-bearing areas and lift points.

(h) Dimensions. Mark outside dimensions for all containers having any dimensions of 72 inches or greater.

3.37.4 Handling

a. Special Handling Equipment and Tools. Turbines require special lifting and handling equipment. Always use heavy lift equipment to handle turbines. **DO NOT** lift turbines with wire straps around or directly applied to turbine casings. Check lift capabilities and condition of handling equipment before attempting to handle turbines. Always use specially designed turbine bases if available.

b. Special Handling Procedures. Handle with extreme care. The heavy weight, large dimensions and critical nature of turbines require utmost attention to detail in equipment handling procedures. Handle turbines by specially designated lift points only.

c. Safety Requirements. Use caution when handling turbines.

3.37.5 Storage

a. Environment.

Controlled Humidity Warehouse	Heated Warehouse	Unheated Warehouse	Open Covered Storage	Open Storage
a				

a - Give steam turbines the best available protection, even if non-RFI. If turbine size and weight prohibit the use of inside storage area, the Inventory Manager should be

advised. The equipment interior should be placed under desiccation by using a portable desiccation system. Cover the turbine with a reinforced, waterproof shroud or tarpaulin. **DO NOT** remove desiccant from turbines packaged Method 50. Leave inspection ports accessible for periodic checks of humidity indicators.

b. Segregation. None required.

c. Shelf Life. Generally, steam turbines are considered non-deteriorative, but may contain materials or components that can degrade during extended storage. Maintain periodic inspections per subparagraph 3.37.2. Consult the cognizant MATREP, Inventory Manager or technical manual for detailed requirements.

d. Special Storage Requirements. **DO NOT** superimpose loads on turbines.

3.37.6 Transportation

a. General. Steam turbines may be shipped by any mode, but the size and weight of individual turbines may severely limit the type vehicle that can carry them. Special permits may be required from state and/or local authorities to move the equipment over the road. Special right-of-way clearances will also be required for some turbines. Unpacked equipment and equipment packed in open crates or boxes that will be exposed to the environment during transit shall be secured and covered with a waterproof shroud or cover.

b. Special. Advise the appropriate Transportation Officer of any unique or unusual requirements.

c. Loading. The size of some turbines may force shipment by open conveyance. After totally securing the turbine against shifting and movement, add barrier material, tarpaulins, etc. Make sure turbines are bolted to specially designed turbine bases.

d. Carrier.

(1) Over the Road. The size and weight of large ship steam turbines will require special heavy lift "low boy" trailers.

(2) Rail. Large ship turbines will require open flatcars for shipment by rail. Use special air-cushioned cars.

(3) Water. Large ship turbines will require a break bulk carrier or covered barge. **DO NOT** store turbines on the weather-deck.

(4) Air. Use specially designed turbine bases and skids to ensure weight distribution and prevent damage to the aircraft floor.